

Remarks/Arguments

Claims 1-29 remain in this application. To more correctly describe phenomenon of bright edges caused by fringing electrical fields having undesirable orthogonal field components, applicants have substituted the term "disclination" for declination in the specification and in claims 18 and 27. Applicants have also amended claims 1, 11, and 24 to better point out and claim their invention. The amendments have added no new matter.

Before proceeding to address the rejection, applicants will briefly summarize their invention to better assist the examiner in appreciating the difference between applicants' invention and the art of record. Applicants' invention, as recited in pending claims 1-29, concerns a technique for reducing sparkle artifacts in a LCOS imager (display device). Such artifacts are attributable to adjacent less bright pixels with unequal brightness, resulting from fringing electrical fields that have a component orthogonal to the desired field. The sparkle artifact problem is time invariant and is unrelated to motion in the image. To overcome the sparkle artifact problem, applicants decompose the video signal of a picture into a higher brightness level signal and a lower brightness level signal. The demarcation between higher and lower brightness levels is adjustable and preferably related to the transition between the lower and higher gain portions of the gamma table. The lower brightness level signal is low pass filtered to reduce the difference in brightness levels between adjacent pixels. The higher brightness level signal is delayed in time to match the processing delay through the low pass filter. The delay matched higher brightness level signal and the low pass filtered lower brightness level signal are then combined to form a modified video signal that yields reduced sparkle artifacts in the LCOS display device.

The subject matter of the instant application (sparkle reduction) is related to applicants' co-pending applications Serial No. 09/803,248 and 09/803,249, which are currently under rejection by the United States Patent and Trademark Office. Accompanying this application is a Supplemental Information Disclosure Statement that lists art cited in each of the other applications.

35 U.S.C. 112 (second paragraph) Rejection of Claims 1-29

The examiner has rejected claims 1-29 under 35 U.S.C. 112 (second paragraph). In particular, the examiner contends that the phrase "less likely" in claims 1, 11, and 24 renders

these claims indefinite since the claims will include elements not actually disclosed ('those encompassed by "less likely"), rendering the claim scope unascertainable.

In an effort to better point out and claim their invention, applicants have amended claims 1, 11 and 21 to recite that the modified video signal yields reduce sparkle artifacts. Ample antecedent basis exists in the specification for such a recitation.

As amended, claims 1, 11 and 21, and the claims that depend therefrom, comply with 35 U.S.C. 112 and withdrawal of that rejection is requested.

35 U.S.C. 103(a) Rejection of Claims 1-4, 6, 11, 14, 16, 21-23 and 25

The examiner has rejected claims 1-4, 6, 11, 14, 16, 21-23 and 25 under 35 U.S.C. 103(a) as obvious over Japanese Application 08-088770, published April 2, 1996, in the name of Iwaki Minoru (hereinafter, the "Iwaki application"), in view of U.S. Patent 6,181,368, issued in the name of Akhiro Takahashi et al., on January 30, 2001, from an application filed December 2, 1997 (hereinafter, the "Takahashi et al patent"), further in view of U.S. Patent 4,499,497, issued in the name of Peter Levine (hereinafter, the "Levine patent"). Applicants respectfully traverse this rejection.

The Iwaki application describes an image capture apparatus that that yields increased resolution while avoiding undesirable patterns. To accomplish this result, the image capture device disclosed in the Iwaki application thresholds the data for each pixel in accordance with high and low brightness values by means of a set of comparator circuits (4-7). A set of delay circuits (1-3) delay the output of the comparator circuits to allow classification of the luminance into different levels, thereby permitting classification of the pictures elements as black or white.

While the Iawki application purportedly suggests decomposing an incoming image signal into high and low brightness values, such decomposition occurs for the purpose of assigning a block or white value to a corresponding picture element *in an image capture device*. The Iwaki et al. application contains no disclosure of the problem of sparkle artifacts in a LCOS display device, let alone that decomposition of the incoming image signal would alleviate such artifacts.

The Takahashi et al. patent discloses an electronic endoscope having a solid state imaging device. As disclosed in FIG. 18, the endoscope of Takahashi et al. includes a low-pass filter (34) for filtering the output signal of the solid state imager to remove noise. As with the Iwaki application, the Takahashi et al. patent does not concern itself with the problem of reducing sparkle in an LCOS display device. Applicants submit that the Takahashi et al. patent does disclose the desirability of low-pass filtering an imager output signal to reduce noise. However,

the Takahashi et al. patent contains absolutely no disclosure of low-pass filtering a lower brightness signal decomposed from an incoming video signal to reduce brightness variations between adjacent pixels in a LCOS display device that result in undesirable sparkle artifacts.

The Levine patent concerns a Charge-Coupled Device (CCD) image with improved response time. The CCD imager achieves improved signal-to-noise performance by spatial integration of the image at reduced light levels. Such spatial integration is achieved by modifying the reset of the floating diffusion to reduce the portion of the floating charge transferred from under the floating diffusion in inverse relation with the level of the charge. The Levine CCD imager includes a cross fade circuit that cross-fades between the output of a peaking circuit that corrects for low brightness, and the output of a delay circuit that delays the output of an automatic gain control circuit. Like both the Iwaki application and the Takahashi patent, the Levine patent does not concern itself with reducing sparkle artifacts in a LCOS display device. Moreover, assuming arguendo that the Levine patent did concern itself with reducing sparkle artifacts in a LCOS display device, the cross fader (29) does combine the low brightness and delayed signals as recited in applicants' claims, but rather selects between such signal.

In rejecting applicants' claims, the examiner contends that it would have been obvious to incorporate the Takahashi et al. and Levine approaches to reducing sparkle artifacts in the Iwaki apparatus to improve signal to noise ratio. The examiner's rejection lacks merit. To establish a *prima facie* case of obviousness, MPEP §2142 requires that the rejection meet three basic criteria. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

As discussed, none of the references, concerns itself with the problem of reducing sparkle artifacts in a LCOS display device attributed to fringing fields that cause a variation in brightness of adjacent pixels. Indeed, none of the references relates to a LCOS display device at all. Rather, each of the references concerns an image capture device, in contrast to the LCOS display device recited in applicants' claims. Given that none of the references relate to a LCOS display device, and more particularly, to the problem of reducing sparkle artifacts in such a display device, no motivation exists in any of the references for their combination to yield applicants' sparkle artifact reduction technique. Secondly, since none of the references concerns itself with sparkle artifact reduction in a LCOS display device, no reasonable expectation of success can possibly exist that the combination would indeed operate as proposed to reduce sparkle artifacts.

Lastly, even the references were combined, the combination would not yield all of the features of applicants claims, including the feature of generating a modified video signal yielding reduced sparkle artifacts in a LCOS display device.

Based on the foregoing, the examiner has not established a *prima facie* case for the obviousness of claims 1-4, 6, 11, 14, 16, 21-23 and 25. Accordingly, applicants request withdrawal of the 35 U.S.C. 103(a) rejection of these claims.

35 U.S.C. 103(a) Rejection of Claims 5, 15 and 24

The examiner has rejected claims 5, 15, and 24 under 35 U.S.C. 103(a) as obvious over the Iwaki application, in view of the Takahashi et al. and Levine patents, as applied to claims 1-4, 6, 11, 14, 16, 21-23, and 25, further in view of U.S. Patent 5,361,094, issued in the name of Ji-hoon Jang (hereinafter, the "Jang patent."). Applicants respectfully traverse the rejection.

Applicants have discussed the Iwaki application, and Takahashi et al. and Levine patents previously with respect to the 35 U.S.C. 103(a) rejection of claims 1-4, 6, 11, 14, 16, 21-23 and 25 and will not repeat that discussion here. For purposes of addressing the present rejection, applicants reiterate that none of the references concerns itself with the problem of reducing sparkle artifacts in a LCOS display device.

The Jang patent concerns a CCD camera with gamma correction. Within the CCD imager, a DC level compensator (56) serves to combine and low-pass filter a gamma corrected signal and the 1H and 2H delay signals and to yield a luminance signal. The DC compensator (56) of Jang has a Z transform function with a transform function of $\frac{1+Z^{-1}}{2}$.

In rejecting claims 5, 15, and 24, the examiner contends that the combination of the Iwaki application and Takahashi et al. and Levine patents, teach all of the features of applicants' claims except low pass filtering in accordance with a 1:2:1 Z transform. The examiner contends that the Jang patent teaches such low pass filtering. The rejection is improper for several reasons. First, the Jang patent, like the Iwaki application and Takahashi et al. and Levine patents, does not address the problem of reducing sparkle artifacts in a LCOS display device. Thus, no motivation exists in any of the references for their combination to yield a device for reducing sparkle artifacts in a LCOS display device.

Assuming arguendo that the proposed combination of Iwaki application and the Takahashi et al., Levine and Jang patents taught a sparkle artifact reduction technique, such a combination would not teach all of the features of applicants' claims. In particular, the proposed

combination would not teach applicants' technique of low pass filtering in accordance with a normalized 1:2:1 Z-transform. Of the cited references, only the Jang patent teaches low pass filtering with a Z transform. However, Jang teaches a z transform function of $\frac{1+Z^{-1}}{2}$ whereas applicants employ a z transform function of $\frac{1+2Z^{-1}+Z^{-2}}{4}$ to yield the 1:2:1 transform recited in applicants' claims 5, 14 and 24. Accordingly, applicants' claims 5, 14 and 24 are non-obvious and patentable over the art of record and applicants request withdrawal of the 35 U.S.C. 103(a) rejection of these claims.

35 U.S.C. 103(a) Rejection of Claims 7-9, 17 and 26

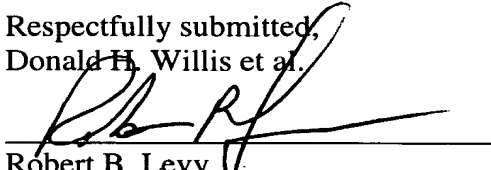
The examiner has rejected claims 7-9, 17 and 25 under 35 U.S.C. 103(a) as obvious in view of the Iwaki application and the Takahashi et al., Levine, and Jang patents. In particular, the examiner contends that it would have been obvious to treat the luminance signal with low brightness and the chrominance signal with high brightness to accomplish sparkle artifact reduction.

The examiner's rejection lacks merit because none of the references alone, or in any combination with each other, concerns itself with sparkle artifact reduction in a LCOS display device. Therefore, the examiner's proposed combination would not teach or in anyway suggest of applying applicants' sparkle reducing steps to any of the video signals as recited in claims 7-9. Applicants' claims 17 and 26 depend from claims 11 and 21, respectively, and incorporate by reference all of the features thereof. Thus, claims 17 and 27 are non-obvious over the art of record because these claims incorporate by reference the feature of generating a modified video yielding reduced sparkle artifacts. None of the references, either alone or in combination with any of the others teaches or suggests this feature of applicants' claims. Accordingly, applicants request withdrawal of the 35 U.S.C. 103(a) rejection of claims 7-9, 17, and 26.

Conclusion

Based on the foregoing remarks, applicants deem this application in condition for allowance and solicit such action. If, however, the Examiner is of the opinion that such action cannot be taken, the Examiner is invited to contact the applicant's attorney at (609) 734-6820, so that a mutually convenient date and time for a telephonic interview may be scheduled. No fee is believed due. However, if a fee is due, please charge the additional fee to Deposit Account 07-0832.

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